04.5801 POWERPLANT INSTRUMENTS AND CONTROLS. (See Sections 04.650 and 04.651.)

04.5802 FUEL QUANTITY GAUGE. (See 04.624.)

04.5803 MAGNETIC COMPASS. This instrument shall be properly damped and compensated and shall be located where it is least affected by electrical disturbances and magnetic influences.

04.5804 NAVIGATION INSTRUMENTS. Navigation instruments for use by the pilot shall be so installed as to be easily visible to him with the minimum practicable deviation from his normal position and line of vision when he is looking out and forward along the flight path and they shall also be visible to the second pilot.

04.5805 GYROSCOPIC INSTRUMENTS. All gyroscopic instruments shall derive their energy from engine-driven pumps or from auxiliary power units. Each source of energy supply and its attendant complete installation shall comply with the instrument manufacturer's recommendations for satisfactory instrument operation. On multiengine aircraft each instrument shall have two separate sources of energy, either one of which shall be capable of carrying the required load. Engine-driven pumps, when used, shall be on separate engines. The installation shall be such that failure of one source of energy or breakage of one line will not interfere with proper functioning of the instruments by means of the other source.

04.581 SAFETY EQUIPMENT INSTALLATION.

04.5810 SAFETY BELTS. Safety belts shall be so attached that no part of the attachment will fail at a load lower than that specified in Sec. 04.2640.

04.5811 FIRE EXTINGUISHERS. The portable fire extinguisher specified in Sec. 04.510 shall be so installed as to be accessible to the passengers. The two portable fire extinguishers specified in Sec. 04.530 shall be so installed that one is readily available to the crew and the other is near the main external cabin door where it shall be readily available to passengers and ground personnel.

04.5812 SAFETY BELT SIGNAL. When a signal or sign is used to indicate to passengers the times that seat belts should be fastened, such signal or sign shall be located in a conspicuous place and so arranged that it can be operated from the seat of either pilot.

04.5813 LANDING FLARES. Landing flares shall be releasable from the pilot's compartment. Structural provisions shall be made for the recoil loads.

04.5814 DE-ICERS. Positive means shall be provided for the deflation of all wing boots.

During the official type inspection tests, the actual operation and effect upon performance and flight characteristics will be observed for any de-icing devices provided for wings, tail surfaces, propellers, etc. No hazardous effects on flight characteristics shall result during their operation.

04.582 ELECTRICAL EQUIPMENT INSTALLATION.

04.5820 GENERAL. Electrical equipment shall be installed in accordance with accepted practice and suitably protected from fuel, oil, water and other detrimental substances. Adequate clearance shall be

provided between wiring and fuel and oil tanks, fuel and oil lines, carburetors, exhaust piping and moving parts.

04.5821 BATTERY. Battery shall be easily accessible and adequately isolated from fuel, oil and ignition systems. Adjacent parts of the aircraft structure shall be protected with a suitable acid-proof paint if the battery contains acid or other corrosive substance and is not completely enclosed. If the battery is completely enclosed, suitable ventilation shall be provided. All batteries shall be so installed that spilled liquid will be suitably drained or absorbed without coming in contact with the airplane structure.

Regulations do not specify minimum permissible capacity for storage batteries. However, as a general rule, when no generator is installed, the battery should be capable of carrying the demand electrical load during a period equal to the cruising endurance of the aircraft without the battery voltage decreasing to less than 80% of normal while under the load which could be expected to exist at the end of the flight. When a generator capable of carrying the running load is installed, the above capacity may be reduced to 50% of the endurance.

The battery must be installed in an accessible location and adequately isolated from fuel, oil, and ignition systems. Adjacent structural parts of the aircraft must be protected with a suitable acid proof paint if the battery contains acid or other corrosive substances and is not completely enclosed. When the battery is completely enclosed, ventilation must be provided since gases from an active battery form an explosive mixture. A means must also be provided whereby spilled liquid is absorbed or drained without coming in contact with the aircraft structure.

Batteries should not be located in engine compartments unless adequate measures are taken to guard against possible fire hazards and the injurious effects on a battery of excessively high temperatures. Battery manufacturers have determined that temperatures of 110 degrees F. and higher cause wooden separators to deteriorate rapidly and temperatures of 125 degrees F. and higher are injurious to batteries having composition separators. Therefore, the critical temperature specified by the battery manufacturers should not be exceeded. Forced ventilation of the battery container or compartment may be necessary to guard against excessive battery temperatures. This may be provided by means of a tube leading from the slip stream into the container or compartment with a suitable vent tube leading out of it.

Leakproof batteries listed in Product & Processes Specification No. 17 need not be enclosed nor will a drain be required. A suitable placard should be installed to prevent the installation of a standard battery in such cases.

04.5822 FUSES. Fuses shall be so located that they can readily be replaced in flight. They shall break the current in a generating system at a sufficiently small current flow to adequately protect the lights, radio equipment and other parts of the circuit.

A fuse should be provided in each circuit of the electrical system, except that no fuse is necessary in the starter main circuit. A complete set of spare fuses should be provided. All fuses and spares must be accessible to a member of the crew while in flight. The fuse block should be marked to show the required amperage and to identify the circuit.

04.5823 GENERATOR. When a generator is specified it shall have sufficient capacity to carry the entire running load. Such generator shall be engine-driven unless an approved equivalent system is provided. Auxiliary power units will be approved in lieu of batteries and engine-driven generators, provided that they are at least two in number and that the supply system is capable of carrying the entire running load with any one unit out of action.

Generators are not listed as certificated items of equipment. A generator of any capacity may be installed on aircraft except that where a generator is required for a specific operation, such as certain air carrier

and instrument flying operations, it must be of sufficient capacity to carry the entire running load and should have sufficient additional capacity to recharge the batteries. (See CAR 04.58230.)

Wind-driven generators should be so located that the extended propeller swept disc does not intersect any portion of the pilot or passengers when they are in their respective seats, unless a protective strip of metal or other material is placed between the propeller and the person intersected. In addition, if at all possible, the swept disc of the propeller should not intersect any fuel, oil or hydraulic lines.

It is recommended that a fuse or equivalent be installed in the circuit between generator and battery of all installations. Wiring must be protected against wear due to chafing and against deterioration due to oil or other substances.

04.58230 RUNNING LOAD. The running load shall be defined as the electric consumption of all lights, radio equipment and other electrical devices except those which are designed only for occasional intermittent use. Examples of devices regarded as intermittent are radio broadcasting equipment, landing lights and electrically operated landing gears and wing flaps. Radio range signal receivers and all other lights are considered a part of the constant load.

04.5824 ANCHOR LIGHTS. The anchor light specified for seaplanes and amphibians shall be so mounted and installed that, when the airplane is moored or drifting on the water, it will show a white light visible for at least two miles at night under clear atmospheric conditions.

04.5825 LANDING LIGHTS. Electric landing lights shall be so installed on multiengine aircraft that at least one shall be not less than 10 feet to the right or left of the first pilot's seat and beyond the swept disk of the outermost propeller. On single-engine aircraft such lights shall be so installed that no visible portion of the swept disk of the propeller, if of the tractor type, is illuminated thereby. Individual switches for each light shall be provided in the pilot's compartment.

04.5826 INSTRUMENT LIGHTS. Instrument lights shall be so installed as to provide sufficient illumination to make all flight instruments easily readable and shall be equipped with rheostat control for dimming unless it can be shown that a non-dimming light is satisfactory.

04.5827 POSITION LIGHTS shall be installed so that, with the airplane in normal flying position, the forward red position light is displayed on the left side and the forward green position light on the right side, each showing unbroken light between two vertical planes whose dihedral angle is 110 degrees when measured to the left and right, respectively, of the airplane from dead ahead. Such forward position lights shall be spaced laterally as far apart as practicable. One rear position light shall be installed on the airplane at the rear and as far aft as possible and shall show a light visible aft throughout a dihedral angle of 140 degrees bisected by a vertical plane through the longitudinal axis of the airplane. Such light shall emit (A) in the case of a non-air carrier airplane, either a continuous white light as specified in CAR 15.2014 or alternate red and white flashes as specified in CAR 15.2015, and (B) in the case of an air carrier airplane, alternate red and white flashes as specified in CAR 15.2015. In lieu of such a single flashing rear position light, an airplane may carry two rear position lights, one red and one white, spaced as closely as possible to each other with one unit above the other and in combination emitting the red and white flashes specified in CAR 15.2015.

"Position lights shall be installed so that, with the airplane in normal flying position, the forward red position light is displayed on the left side and the forward green position light on the right side, each showing unbroken light between two vertical planes whose dihedral angle is 110 degrees when measured to the left and right, respectively, of the airplane from dead ahead. Such forward position lights shall be spaced laterally as far apart as practicable. One rear position light shall be installed on the airplane at the rear and as far aft as possible and shall show a light visible aft throughout a dihedral angle of 140 degrees bisected by a vertical plane through the longitudinal axis of the airplane. Such light shall emit (a) in the case of a non-air carrier airplane, either a continuous white light as specified in 15.2014 or alternate

red and white flashes as specified in 15.2015, and (b) in the case of an air carrier airplane, alternate red and white flashes as specified in 15.2015. In lieu of such a single flashing rear position light, an airplane may carry two rear position lights, one red and one white, spaced as closely as possible to each other and in combination emitting the red and white flashes specified in 15.2015."

All wiring must be firmly fixed to the aircraft structure and protected against chafing or rapid deterioration.

04.5828 MASTER SWITCH. Electrical installations shall incorporate a master switch easily accessible to a member of the crew.

All electrical installations must incorporate a master switch. A master switch is interpreted as being a switch by means of which all sources of electrical power may normally be disconnected from the electrical distribution system of the airplane and from each other at a point in the supply lines as near as practicable to the source of power. In installations which involve only one circuit, the circuit control switch may be considered as a master switch provided it is as near the ungrounded battery terminal as practicable.

04.589 MISCELLANEOUS EQUIPMENT INSTALLATION.

04.5890 SEATS. Seats or chairs, even though adjustable, in open or closed airplanes, shall be securely fastened in place whether or not the safety belt load is transmitted through the seat.

04.5891 ACCESSORIES. Engine-driven accessories on multiengine aircraft shall be distributed across two or more engines.